

Claims

WHAT IS CLAIMED IS:

1. A method comprising:
computing a minimum cost path in a stereo disparity model between a scan line of a first image and a corresponding scan line of a second image of a stereo pair, the stereo disparity model distinguishing between non-fronto-parallel pixels in each scan line and occluded pixels in each scan line.

2. The method of claim 1 wherein the computing operation comprises:

computing matching costs for each pixel of each scan line pair.

3. The method of claim 1 wherein the computing operation comprises:

computing matching costs for each pixel of each scan line pair using a
weighted matching cost function.

4. The method of claim 1 wherein the computing operation comprises:

altering the matching costs for at least one pixel pair based on whether the pair is determined to be associated with a non-fronto-parallel surface or an occlusion.

5. The method of claim 1 wherein the computing operation comprises:

determining a minimum cost path in the stereo disparity model.

6. The method of claim 1 wherein the computing operation comprises:

applying a cost penalty to a move from an occluded pixel pair to a matched pair.

1 7. The method of claim 1 wherein the computing operation comprises:
2 applying a cost penalty to a move from a matched pixel pair to an occluded
3 pixel pair.

4 8. The method of claim 1 wherein the computing operation comprises:
5 applying a cost penalty to a move from an occluded pixel pair to another
6 occluded pixel pair.

7 9. The method of claim 1 wherein the computing operation comprises:
8 applying a first cost penalty to a move from an occluded pixel pair to
9 another occluded pixel pair; and

10 applying a second cost penalty to a move from a matched pixel pair to an
11 occluded pixel pair, the first cost penalty being different than the second cost
12 penalty.

14 10. The method of claim 1 wherein the computing operation comprises:
15 applying a first cost penalty to a move from an occluded pixel pair to
16 another occluded pixel pair; and
17 applying a second cost penalty to a move from a matched pixel pair to an
18 occluded pixel pair, the first cost penalty being less than the second cost penalty.

19 11. The method of claim 1 further comprising:
20 computing a cyclopean virtual image scan line based on corresponding
21 pixels of the scan lines of the first and second images, a disparity of the
22 corresponding pixels being characterized by a minimum cost path of the stereo
23 disparity model.

1 12. The method of claim 1 further comprising:

2 computing a cyclopean virtual image scan line based on corresponding
3 pixels of the scan lines of the first and second images, wherein corresponding
4 pixels that are matched are projected as a virtual pixel onto the cyclopean virtual
5 image scan line.

6 13. The method of claim 1 further comprising:

7 computing a cyclopean virtual image scan line based on corresponding
8 pixels of the scan lines of the first and second images, wherein corresponding
9 pixels that are averaged to determine a value of a resulting virtual pixel on the
10 cyclopean virtual image scan line.

11 14. The method of claim 1 further comprising:

12 computing a cyclopean virtual image scan line based on corresponding
13 pixels of the scan lines of the first and second images, wherein a non-occluded
14 pixel of an occluded pair of corresponding pixels is projected as a virtual pixel
15 onto the cyclopean virtual image scan line from a background disparity in the
16 stereo disparity model.

17 15. The method of claim 1 further comprising:

18 computing a cyclopean virtual image scan line based on corresponding
19 pixels of the scan lines of the first and second images, wherein a value of a non-
20 occluded pixel of an occluded pair of corresponding pixels is selected as a value of
21 a resulting virtual pixel on the cyclopean virtual image scan line.

1 16. A computer program product encoding a computer program for
2 executing on a computer system a computer process, the computer process
3 comprising:

4 computing a minimum cost path in a stereo disparity model between a scan
5 line of a first image and a corresponding scan line of a second image of a stereo
6 image pair, the stereo disparity model distinguishing between non-fronto-parallel
7 matched pixels in each scan line and occluded pixels in each scan line.

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9 17. The computer program product of claim 16 wherein the computing
10 operation comprises:

11 computing matching costs for each pixel of each scan line pair.

12 18. The computer program product of claim 16 wherein the computing
13 operation comprises:

14 computing matching costs for each pixel of each scan line pair using a
15 windowed matching cost function.

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17 19. The computer program product of claim 16 wherein the computing
18 operation comprises:

19 altering the matching costs for at least one pixel pair based on whether the
20 pixel pair is determined to be associated with a non-fronto-parallel surface or an
21 occlusion.

22 20. The computer program product of claim 16 wherein the computing
23 operation comprises:

24 determining a minimum cost path in the stereo disparity model.

1 21. The computer program product of claim 16 wherein the computing
2 operation comprises:

3 applying a cost penalty to a move from an occluded pixel pair to a matched
4 pixel pair.

5 22. The computer program product of claim 16 wherein the computing
6 operation comprises:

7 applying a cost penalty to a move from a matched pixel pair to an occluded
8 pixel pair.

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10 23. The computer program product of claim 16 wherein the computing
11 operation comprises:

12 applying a cost penalty to a move from an occluded pixel pair to another
13 occluded pixel pair.

14 24. The computer program product of claim 16 wherein the computing
15 operation comprises:

16 applying a first cost penalty to a move from an occluded pixel pair to
17 another occluded pixel pair; and

18 applying a second cost penalty to a move from a matched pixel pair to an
19 occluded pixel pair, the first cost penalty being different than the second cost
20 penalty.

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22 25. The computer program product of claim 16 wherein the computing
23 operation comprises:

24 applying a first cost penalty to a move from an occluded pixel pair to
25 another occluded pixel pair; and

1 applying a second cost penalty to a move from a matched pixel pair to an
2 occluded pixel pair, the first cost penalty being less than the second cost penalty.

3 26. The computer program product of claim 16 wherein the computer
4 process further comprises:

5 computing a cyclopean virtual image scan line based on corresponding
6 pixels of the scan lines of the first and second images, a disparity of the
7 corresponding pixels being characterized by a minimum cost path of the stereo
8 disparity model.

9 27. The computer program product of claim 16 wherein the computer
10 process further comprises:

11 computing a cyclopean virtual image scan line based on corresponding
12 pixels of the scan lines of the first and second images, wherein corresponding
13 pixels that are matched are projected as a virtual pixel onto the cyclopean virtual
14 image scan line.

15 28. The computer program product of claim 16 wherein the computer
16 process further comprises:

17 computing a cyclopean virtual image scan line based on corresponding
18 pixels of the scan lines of the first and second images, wherein corresponding
19 pixels that are averaged to determined a value of a resulting virtual pixel on the
20 cyclopean virtual image scan line.

1 29. The computer program product of claim 16 wherein the computer
2 process further comprises:

3 computing a cyclopean virtual image scan line based on corresponding
4 pixels of the scan lines of the first and second images, wherein a non-occluded
5 pixel of an occluded pair of corresponding pixels is projected as a virtual pixel
6 onto the cyclopean virtual image scan line from a background disparity in the
7 stereo disparity model.

8 30. The computer program product of claim 16 wherein the computer
9 process further comprises:

10 computing a cyclopean virtual image scan line based on corresponding
11 pixels of the scan lines of the first and second images, wherein a value of a non-
12 occluded pixel of an occluded pair of corresponding pixels is selected as a value of
13 a resulting virtual pixel on the cyclopean virtual image scan line.

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1 31. A system comprising:

2 a dynamic programming module computing a minimum cost path in a
3 stereo disparity model between a scan line of a first image and a corresponding
4 scan line of a second image of a stereo image pair, the stereo disparity model
5 distinguishing between non-fronto-parallel matched pixels in each scan line and
6 occluded pixels in each scan line.

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8 32. The system of claim 31 wherein the dynamic programming module
9 computes matching costs for each pixel of each scan line pair.

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11 33. The system of claim 31 wherein the dynamic programming module
12 computes matching costs for each pixel of each scan line pair using a windowed
13 matching cost function.

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15 34. The system of claim 31 wherein the dynamic programming module
16 alters the matching costs for at least one pixel pair based on whether the pixel pair
17 is determined to be associated with a non-fronto-parallel surface or an occlusion.

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19 35. The system of claim 31 wherein the dynamic programming module
20 determines a minimum cost path in the stereo disparity model.

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22 36. The system of claim 31 wherein the dynamic programming module
23 applies a cost penalty to a move from an occluded pixel pair to a matched pixel
24 pair.

1 37. The system of claim 31 wherein the dynamic programming module
2 applies a cost penalty to a move from a matched pixel pair to an occluded pixel
3 pair.

4 38. The system of claim 31 wherein the dynamic programming module
5 applies a cost penalty to a move from an occluded pixel pair to another occluded
6 pixel pair.

7 39. The system of claim 31 wherein the dynamic programming module
8 applies a first cost penalty to a move from an occluded pixel pair to another
9 occluded pixel pair and a second cost penalty to a move from a matched pixel pair
10 to an occluded pixel pair, the first cost penalty being different than the second cost
11 penalty.

13 40. The system of claim 31 wherein the dynamic programming module
14 applies a first cost penalty to a move from an occluded pixel pair to another
15 occluded pixel pair and a second cost penalty to a move from a matched pixel pair
16 to an occluded pixel pair, the first cost penalty being less than the second cost
17 penalty.

18 41. The system of claim 31 further comprising:

19 a cyclopean virtual image generator computing a cyclopean virtual image
20 scan line based on corresponding pixels of the scan lines of the first and second
21 images, a disparity of the corresponding pixels being characterized by a minimum
22 cost path of the stereo disparity model.

1 42. The system of claim 31 further comprising:

2 a cyclopean virtual image generator computing a cyclopean virtual image
3 scan line based on corresponding pixels of the scan lines of the first and second
4 images, wherein corresponding pixels that are matched are projected as a virtual
5 pixel onto the cyclopean virtual image scan line.

6 43. The system of claim 31 further comprising:

7 a cyclopean virtual image generator computing a cyclopean virtual image
8 scan line based on corresponding pixels of the scan lines of the first and second
9 images, wherein corresponding pixels that are averaged to determined a value of a
10 resulting virtual pixel on the cyclopean virtual image scan line.

11 44. The system of claim 31 further comprising:

12 a cyclopean virtual image generator computing a cyclopean virtual image
13 scan line based on corresponding pixels of the scan lines of the first and second
14 images, wherein a non-occluded pixel of an occluded pair of corresponding pixels
15 is projected as a virtual pixel onto the cyclopean virtual image scan line from a
16 background disparity in the stereo disparity model.

18 45. The system of claim 31 further comprising:

19 a cyclopean virtual image generator computing a cyclopean virtual image
20 scan line based on corresponding pixels of the scan lines of the first and second
21 images, wherein a value of a non-occluded pixel of an occluded pair of
22 corresponding pixels is selected as a value of a resulting virtual pixel on the
23 cyclopean virtual image scan line.